

Substitution of Drawings

Please substitute the formal drawings accompanying this Response for the drawings originally submitted.

REMARKS

This Amendment is responsive to the Office Action dated June 17, 2005. Applicant has cancelled claims 7-12 and amended claims 1 and 6 such that claims 1-6 are pending. Applicant respectfully requests reconsideration of the pending claims based on these amendments and the following remarks.

Initially, Applicant hereby affirms Applicant's provisional election by telephone on April 18, 2005, and elects to prosecute Group 1, containing Claims 1-6, drawn to a method for interconnecting angularly disposed conductive patterns in Class 29, subclass 840. Applicant expressly reserves the right to present the non-elected claims in one or more divisional applications.

The title has been amended to reflect the fact the elected claimed invention excludes an assembly.

The Office Action rejected claims 1-5 under 35 USC 103(a) as being unpatentable over U.S. Patent No. 4,495,546 to Nakamura, et al. Claim 6 was objected to as being dependent upon a rejected base claim, but allowable if rewritten in independent form to include all of the limitations of the base claim.

Independent Claim 1 and dependent claim 6 have been amended to recite process steps not disclosed or suggested in the cited reference.

Applicant has carefully reviewed the applied reference and respectfully submits that, in light of the amendments herein, the claimed invention is patentably distinguishable over the applied references for at least the following reasons.

Specifically, conductive wire balls formed by a wire bond machine are provided in the claimed invention at the terminal interface (i.e., junction) of two angularly disposed

conductive surfaces, such as exist where a three-dimensional, multilayer module is bonded to a printed circuit board for electrical interconnection to same. See Figs 2-4 of the pending application.

As best understood, Nakamura et al. discloses a hybrid circuit component comprised of a flex circuit with conductive circuitry and electrical components disposed thereon. The flex circuit is bonded on two separate mounting plates whereby the assembly can be folded for mounting on and within a motherboard. See Nakamura, et al., column 2, lines 55-70.

With respect to the pending application, it is well-known in the field of wire-bonding that wire bonding machines are used to conductively attach a wire ball formed on the end of a spool of wire to a first conductive surface using a small diameter wire (e.g., 1 mil), then leading the attached wire to a second conductive surface where a wedge bond is conductively attached, which wedge bond action concurrently severs the wire to form an electrical connection between the first and second conductive surfaces.

The above first and second electrical connections are formed using a thermo-sonic or thermo-compression process that is localized precisely at the wire bond site. The above wire bonds are formed primarily of gold or gold alloy wire, or occasionally aluminum wire.

As is also well-known in the wire bonding art, wire bond machines can be configured to provide a wire ball (also known as a "stud bump" in the industry) at a given location wherein; 1) a wire ball is formed at the end of the spool of wire, 2) the wire ball is electrically attached to a conductive pattern using thermo-compression or thermo-sonic means and 3) the wire severed from the attached wire ball to define an wire ball upon the

conductive surface. (See also Figs. 2-4 and paragraphs 23-25 of the published application).

The resultant wire ball has the desirable attribute creating an electrical connection but not requiring solder reflow or heating as a conventional solder connection requires. Rather, the wire ball provides a stable, function electrical connection immediately without further processing. This permits assemblies that have pre-existing solder connections to be electrically connected without the risk of inadvertently reflowing preexisting solder joints in a second reflow operation and avoids the risk of overheating delicate assemblies such as optical or sensor assemblies in a solder reflow operation.

The use of a wire ball also provides a well-matched coefficient of thermal expansion relative to solder, greatly reduced weight and the ability to form small, angular connections within a very small foot print, which attributes cannot be achieved with a reflowed solder connection.

On the other hand, Nakamura specifically teaches that the disclosed hybrid circuit component must be soldered to the motherboard. See Nakamura et al., at column 5, lines 1-5; lines 45-46; column 6, lines 6-11. Moreover, the cited reference teaches that the hybrid circuit component must be inserted into a slit on a motherboard. See Nakamura, et al., at column 5, lines 41-46, column 5, lines 55-65).

As originally claimed, the wire ball is referred to as a conductive ball which is applied to the interface of the two angularly disposed conductive surfaces whereby the two surfaces are in electrical connection utilizing one or more wire balls. The amended claims are drafted to recite the conductive ball as a wire ball, which is neither taught nor

suggested by Nakamura and which has substantial beneficial metallurgical and processing characteristics over the cited reference.

The subject invention of the amended claims does not contain the limitations of Nakamura and avoids the undesirable processing steps of solder reflow as well as the structural limitation of requiring a slit for receiving the second assembly by the motherboard. Rather, any angularly disposed conductive patterns forming a junction can use the claimed method, with or without a motherboard slit, such as where a three-dimensional electronic module is interconnected upon the planar surface of a motherboard.

Claims 2-5 were rejected under 35 USC 103(a) as obvious in light of Nakamura et al. Applicant respectfully asserts that Claims 2-5 are patentable for the reasons set forth above. Since Claims 2-5 depend directly from Claim 1, these claims are likewise allowable for their dependency and novel limitations therein. Claims 1-6, as amended, contain no new matter and are drafted to avoid the limitations found in the cited reference.

SUMMARY

The applied reference is not understood to disclose or suggest the foregoing features of the present invention in amended claims. Based on the above amendments and accompanying remarks, Applicant respectfully submits that all claims, as amended, are in condition for allowance and earnestly solicits notice thereof.

The Examiner is encouraged to telephone the undersigned attorney if it appears that a telephone conference would facilitate the allowance of the application.



Certificate of Mailing

I certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

By: W. Eric Boyd

Date: Aug 23, 2005

Respectfully submitted,

W. Eric Boyd, Esq.
Registration No. 43509
Irvine Sensors Corporation
3001 Redhill Ave., Bldg 3/108
Costa Mesa, CA 92626
(714) 444-8863